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COORDINATING CONFERENCE ON HEAT-RESISTANT CONCRETE

by K. D. Nekrasov and G. D. Salmanov

- USSR -

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COORDINATING CONFERENCE ON HEAT-RESISTANT CONCRETE

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Following is the translation of an article by K. D. Nekrasov and G. D. Salmanov (Scientific Research Institute for Concrete and Reinforced Concrete of the Academy of Construction and Architecture of the USSR) in Ogneupory (Refractory Materials), No 1, Moscow, 1961, pages 44-46.

In accordance with the decision of the Gosstroy of the USSR [Gosudarstvennoye stroitel'stvo -- State Committee on Construction of the Council of Ministers of the USSR], a conference was held at the Scientific Research Institute for Concrete and Reinforced Concrete of the Academy of Construction and Architecture (AS & A) of the USSR in October 1960 on problems related to the study, design, construction, and operation of thermal units made of heat-resistant concrete and reinforced concrete.

The conference was attended by delegates representing organizations devoted to scientific research and design, industrial establishments, educational institutes, etc.

Director of the Institute for Concrete and Reinforced Concrete, a full member of the AS & A of the USSR, K. N. Kartashov opened the conference and stressed the great importance of adopting the heat-resistant concrete and reinforced concrete in industrial construction.

L. D. Slobodennikov (Gosstroy of the USSR) pointed out the most important problems concerning the technology and adoption of the heat-resistant concrete, which, if solved, will promote the industrialization of operations dealing with construction of thermal installations.

A. V. Zotov (Section for Special and Assembly Operations at the Gosstroy of the USSR) considered in his report the outlook for the wide use of the heat-resistant concrete in building thermal units; vistas that open excellent possibilities in industrialization, reduction of labor costs, and cost of construction of thermotechnical objectives.

The report presented by K. D. Nekrasov (NII Nauchno-issledovatel'skiy institut -- Scientific Research Institute for Concrete and Reinforced Concrete) was devoted to the results of the scientific work and to future tasks in the field of development and adopting of the heat-resistant concrete. It was noted in particular that efforts in scientific research resulted in the development of formulae for various kinds of concrete intended for a number of thermal installations. Still needed are: theoretical and experimental studies concerning physical and chemical

processes which take place during heating and cooling of concrete; development of a working theory of these processes and search for ways and means for increasing the durability of concrete under the conditions of the high temperature effects.

A. F. Milovanov (NII for Concrete and Reinforced Concrete), in his report on heat-resistant reinforced concrete structures, has emphasized the fundamental differences typical of the design of thermal installations built of heat-resisting reinforced concrete.

The methods of calculating the structural components of thermal installations, which had been worked out on the basis of V. I. Murashov's theory concerning the hardness of reinforced concrete, enable us for the first time in the world's history to compute the combined action of high temperature and load on furnaces and other thermal installations.

The reports by S. S. Serebrennikov ("Soyuzteplostroy" Trust -- Vsesoyuznyy proektno-montazhnyy stroitel'nyy trest ognevoy teplotekhniki -- All-Union Trust for Design and Construction of Fuel-Burning Equipment) and A. E. Issers ("Teplomontazh" Trust) discussed the experience gained from the use of heat resistant concrete in construction of industrial furnaces and other thermal units.

Ya. V. Klyucharov (Leningrad Soviet Technological Institute of Leningrad) made a report on composition and properties of the heat-resistant magnesite liquid glass concrete; L. A. Tseytlin (UNIIO Ukrainskiy nauchno-issledovatel'skiy institut organizatsii proizvodstva i upravleniya promyshlennosti -- Ukrainian Scientific Research Institute for Organization of Production and Industrial Management) spoke about the puzziolanic Portland-cement concrete.

G. G. Fel'dgandler (Gisogneupor Proektnyy institut po sluzhbe i kachestvu ogneuporov -- Institute for Design and Inspection of Performance and Quality of Refractory Materials) presented a generalized interpretation of data on the use of heat-resistant concrete in a number of branches of industry.

B. I. Oborin (All-Union Institute of Refractory Materials) reported on the outlook for manufacture and use of heat-resistant concrete in the heat-resistant materials industry and on research work which has been planned by the All-Union Institute for Refractory Materials for 1961.

N. V. Il'yina (Giprotsement -- Gosudarstvennyy institut po proektirovaniyu predpriyatiy i po nauchno-issledovatel'skim rabotam tsementnoy promyshlennosti -- State Institute for the Design and Planning of Establishments and for Scientific Research in the Cement Industry) has pointed out that concrete has a number of advantages over refractory materials made up of pieces, when used for lining of rotating kilns in the cement industry. However, in order to promote a wide use of heat-resistant concrete, a centralized delivery must be organized of concrete constituents to the consumers. A further development of research work is needed in order to improve the composition of the heat-resistant concrete.

E. N. Leve (UNIIO) reported on the experience concerning the experimental use of highly fire-resistant magnesium oxychloride concrete in

the lining of a rotating kiln for burning cement clinker; I. Ya. Zalkind (ORGRES /Gosudarstvennyy trest po organizatsii i ratsionalizatsii elektrostantsiy -- State Trust for the Organization and Rationalization of Electric Power Plants/ spoke about the concrete encasing of modern powerful boiler assemblies.

S. A. Epshtain (Southern Scientific Research Institute for Industrial Construction of the AS & A of the Ukrainian SSR) made a report on heat-resistant concrete with a Portland cement base, produced by utilizing loess and slag fillers, and on practical experience connected with its introduction in the Ukraine.

Ya. M. Gamarnik (Angara Administration of Soyuzteplostroy) discussed the experience gained from building industrial furnaces of heat-resistant concrete and concrete blocks. The use of blocks makes it possible to mechanize a whole series of operations, beginning with the crushing of inert materials and ending with the block assembly; it lowers the cost of construction by one and a half to two times, increasing at the same time the length of service of furnaces.

The report by N. D. Kirichenko (Gipromez /Gosudarstvennyy institut po proektirovaniyu metallurgicheskikh zavodov -- State Institute for the Design and Planning of Metallurgical Plants/) was devoted to the problem of designing an experimental high-temperature air heater of concrete blocks for a large capacity blast furnace and that by S. S. Posternak (Giprokok /Gosudarstvennyy institut po proektirovaniyu predpriyatiy koksokhimicheskoy promyshlennosti -- State Institute for the Design and Planning of Industrial By-Product Coke Enterprises/) to the use of heat-resistant reinforced concrete in the design of foundations for coke ovens.

G. I. Zavelev (Giproneftemash /Gosudarstvennyy nauchno-issledovatel'skiy i proektnyy institut neftyanogo mashinostroyeniya -- State Design and Scientific Research Institute for Petroleum Machinery/) has reported that in many oil refineries, apparatus is protected by fettling made of heat-resistant concrete. This fettling has been in operation without a major overhaul for over six years, securely protecting the apparatus from the action of heat, corrosion, and erosion.

Delegates who took part in the discussion pointed out the need for further research in the field of heat-resistant concrete so that its properties may be improved and formulae developed for duty at temperatures above 1400°C/. Design institutes do not pay enough attention to the introduction of heat-resistant concrete into the construction of thermotechnical installations.

The future broader adoption of heat-resisting concrete requires more profound theoretical studies and more intense experimental work with respect to the technology of concrete and development of new designs for thermal units of concrete and reinforced concrete.

It is necessary to set up manufacturing of concrete blocks of larger size at specialized, well-equipped bases; the refractory materials industry must provide factory-manufactured basic materials needed for the preparation of heat-resisting concrete.

The conference has approved the plan for coordinating the activities of the scientific research and design institutes, sovnarkhozes, and industrial establishments related to problems of study, design, construction, and operation of thermal aggregates made of heat-resistant concrete and reinforced concrete for the years 1961-1965.

The conference has taken note of the desirability of installing special shops for making large heat-resistant concrete blocks at refractories, first of all, at the Nikitovskiy "Combine" and Semiluki and Domodedovo works.

The design institutions of the Gosstroy of the USSR must develop a design for a standard plant which would produce large heat-resistant concrete blocks at the approximate rate of 50,000 cubic meters per year; the planning organizations must designate the sites for construction of such plants and assign capital for this purpose so that a mass production of heat-resisting concrete would be secured within the next three or four years.

The conference has resolved that it is necessary, as of 1961, to solve the problem of satisfying the needs of industry for principal components and ready mixtures of heat-resistant concrete.

For the purpose of training the cadres of specialists in the technology of concrete manufacture and in designing and building thermal installations of heat-resistant concrete and reinforced concrete, the conference regards it as expedient to include subjects dealing with heat-resistant concrete and structures made of it in the curricula of the corresponding institutes and tekhnikums.

The conference has approved the classification which was proposed by the Scientific Research Institute of Concrete and Reinforced Concrete for those types of concrete which are intended for high-temperature duty. The term "heat-resistant concretes" has been adopted as a general name for those types of concrete; depending on their refractoriness, they are subdivided into the highly fire-resistant concrete with refractoriness above 1,770°, fire-resistant having refractoriness between 1,580 and 1,770°, and heat-resisting with refractoriness below 1,580°C/.

The conference has advised the research institutes to expand their activity in the field of heat-resistant concrete and to pay more attention, when choosing topics for study, to the development of theoretical foundations of the heat-resistant concrete, investigation of its properties, and technology of manufacturing.

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